Canada-Manitoba

FLOOD DAMAGE REDUCTION PROGRAM

Annual Report

1986-1987

October 27, 1987

CANADA-MANITOBA
FLOOD DAMAGE REDUCTION PROGRAM

ANNUAL REPORT
FOR
THE PERIOD
APRIL 1, 1986 TO MARCH 31, 1987

Environment Canada
Inland Waters and Lands
Western and Northern Region
1901 Victoria Avenue
Regina, Saskatchewan
S4P 3R4

Province of Manitoba
Department of Natural Resources
Water Resources Branch
1577 Dublin Avenue
Winnipeg, Manitoba
R3E 3J5

CANADA — MANITOBA FLOOD DAMAGE REDUCTION PROGRAM

The Honourable Thomas McMillan
Minister
Department of the Environment
Ottawa, Ontario K1A 0H3

The Honourable John S. Plohman
Minister
Department of Natural Resources
Winnipeg, Manitoba R0C 0V8

Gentlemen:

I am pleased to present the tenth Annual Report of the Canada-Manitoba Steering Committee on the Flood Damage Reduction Program. This report covers the progress made during the period April 1, 1986 to March 31, 1987. The work in the program is authorized by the Agreement Respecting Flood Risk Mapping and the Agreement Respecting Studies for Flood Damage Reduction signed by Canada and Manitoba on December 20, 1976, by the Amending Agreement signed on March 31, 1981, by the Amending Letters of Exchange signed on September 6, 1985, and by the Agreement Respecting Flood Forescasting signed on March 31, 1981.

Under the Agreement Respecting Flood Risk Mapping, designation of flood prone lands at Arborg, Fisher Branch and Riverton was recommended to the ministers. The provincial minister approved of the recommendation and approval of the federal minister is expected in 1987-88. All preparatory work was completed for designating the flood prone lands at Morden and Neepawa. The base mapping of The Pas, Virden, and the Charleswood and St. Norbert areas of Winnipeg was also completed.

A three and one-half year extension to the Agreement Respecting Flood Forecasting, at a cost of $400,000, was authorized by the federal and provincial treasury boards. Work on improving conventional flood forecasting methodology continued under this agreement. Preparation of a formal report on Phase Two activities for the period February, 1984 to March, 1986 is nearing completion. An information brochure on flood forecasting was prepared.

In the 1986-87 fiscal year, expenditures for flood risk mapping and flood damage reduction studies programs totaling $ 138,653.12 were shared equally between Canada and Manitoba. An expenditure of $ 114,505.49 was funded by Manitoba for flood forecasting activities during the period of this report. Canada will reimburse Manitoba for one half of this amount in 1987-88.

Yours sincerely,

R.A. Halliday
Chairman, Steering Committee
1901 Victoria Avenue
Regina, Saskatchewan, S4P 3R4

TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF APPENDICES	iii
SUMMARY	iv
CHAPTERS	
I. THE CANADA-MANITOBA FLOOD DAMAGE REDUCTION AGREEMENTS	1
I.1 Introduction	1
I.2 General Agreement Respecting Flood Damage Reduction (FDR)	1
I.3 Agreement Respecting Flood Risk Mapping	1
I.4 Agreement Respecting Studies for Flood Damage Reduction	2
I.5 Amending Agreement	2
I.6 Amendments, 1985	2
I.7 Agreement Respecting Flood Forecasting	3
I.8 Agreement Respecting the Construction of Flood Protection Projects in Manitoba	3
II. PROGRAM ORGANIZATION	5
II.1 Introduction	5
II.2 Membership: Steering Committee	6
II.3 Membership: Technical Committee on Flood Risk Mapping	7
II.4 Membership: Studies Sub-Committee	8
II.5 Membership: Technical Sub-Committee on Flood Forecasting	9

		PAGE
III.	PROGRAM IMPLEMENTATION	10
	III.1 Scope	10
	III.2 Schedule	11
	III.3 Methodology	11
	III.3.1 Flood Risk Mapping	11
	III.3.2 Flood Damage Reduction Studies	12
	III.3.3 Flood Forecasting	13
	III.4 Work Assignments	14
	III.5 Expenditures	16
IV.	ACTIVITIES UNDER THE FLOOD DAMAGE REDUCTION AGREEMENTS, 1986-1987	17
	IV.1 Flood Risk Mapping Program	17
	IV.1.1 Designation	17
	IV.1.2 Arborg: Icelandic River	17
	IV.1.3 Fisher Branch: Fisher River	18
	IV.1.4 Gimli: Gimli Airport Drain	18
	IV.1.5 Gladstone: Whitemud River	18
	IV.1.6 Grande Pointe: Seine River	18
	IV.1.7 Gretna: Pembina River	18
	IV.1.8 La Riviere: Pembina River	18
	IV.1.9 MacGregor: Beaver Creek	18
	IV.1.10 Melita: Souris River	19
	IV.1.11 Minnedosa: Little Saskatchewan River	19
	IV.1.12 Morden: Dead Horse Creek	19
	IV.1.13 Neepawa: Whitemud River	19
	IV.1.14 Ochre River: Ochre River	19
	IV.1.15 Riverton: Icelandic River	19
	IV.1.16 Ste. Anne: Seine River	20
	IV.1.17 Ste. Rose du Lac: Turtle River	20
	IV.1.18 Souris: Souris River	20
	IV.1.19 The Pas: Saskatchewan River	20

PAGE

IV.1.20 Virden: Bosshill, Gopher and Scallion Creeks 20
IV.1.21 Wawanesa: Souris River 20
IV.1.22 Westbourne: Whitemud River 21
IV.1.23 Winnipeg 21
IV.1.23.1 Omands Creek 21
IV.1.23.2 Red and Assiniboine Rivers and Tributaries 21
IV.1.24 Woodside: Whitemud River 21
IV.1.25 Remaining Communities 22
IV.1.26 Field Survey Checks of Topographic Mapping 22
IV.2 Flood Damage Reduction Studies Program 22
IV.3 The Flood Forecasting Agreement 23

LIST OF TABLES

Table 1 Canada-Manitoba Flood Damage Reduction Program Expenditures for 1977-87 25

Table 2 Canada-Manitoba Flood Damage Reduction Program Status Report to March 31, 1987 27

APPENDICES

A. Areas and floodways to be mapped in the Province of Manitoba. 31
B. Location of areas in the Canada-Manitoba Flood Risk Mapping Agreement. 35

SUMMARY

The base mapping at The Pas, Virden and the Charleswood and St. Norbert areas of Winnipeg was completed under the Agreement Respecting Flood Risk Mapping. Materials that were used to prepare this mapping were sent to Energy, Mines and Resources, Canada for inspection. The final report on the program of field survey checks of existing mapping was completed. Flood damage reduction studies were under way at Elie, Morden and Riverton under the Agreement Respecting Flood Damage Reduction Studies.

Designation of the flood risk areas of Arborg, Fisher Branch and Riverton was recommended to the ministers. The provincial minister approved the recommendation; federal approval is expected in 1987-88. All preparatory work required for designating Morden and Neepawa has also been completed. Thirteen areas including the two largest cities in Manitoba - Winnipeg and Brandon have been designated so far.

Approval was obtained to redesignate an area of Winnipeg (along Kilkenny Drive) that was designated previously as being within the "floodway zone" as part of the "floodway fringe zone". This was done to accomodate flood proofed developments in the area. A review of the proposal indicated that it would not raise flood levels.

A three and one-half year extension to the Agreement Respecting Flood Forecasting, at a cost of $400,000, was authorized by the federal and provincial treasury boards. Work on improving conventional flood forecasting methodology continued under this agreement. An information brochure on flood forecasting was completed. Preparation of a formal report on Phase Two activities for the period February, 1984 to March, 1986 is nearing completion.

During the period of this report, expenditures totaling $138,653.12 were shared equally between Canada and Manitoba for flood risk mapping and flood damage reduction studies programs. An expenditure of $114,505.49 was funded by Manitoba for flood forecasting activities during the period of this report. Canada will reimburse Manitoba for one half of this amount in 1987-88. To date $2,289,119 has been spent on flood risk mapping activities, $244,599 on flood damage reduction studies and $704,656 on flood forecasting activities.

CHAPTER I

THE CANADA-MANITOBA FLOOD DAMAGE REDUCTION AGREEMENTS

On December 20th, 1976, the Governments of Canada and Manitoba signed three agreements whose collective aim is to reduce the potential for flood damages in Manitoba over the long term. These agreements recognize that the best way to reduce potential flood damage is to keep flood prone development out of the floodplain. Protection of existing development could involve a combination of structural and non-structural alternatives, including allowing some flooding to occur, once the potential for flooding has been identified.

I.1 Introduction

The tenth annual report reviews work activities and progress of the Canada-Manitoba Flood Damage Reduction Program during the period April 1, 1986 to March 31, 1987.

I.2 General Agreement Respecting Flood Damage Reduction (FDR)

The General Agreement outlines the policies respecting government undertakings and programs in flood risk areas and provides a co-ordinated framework for a number of implementation sub-agreements. Listed below are the agreements which are now in effect.

I.3 Agreement Respecting Flood Risk Mapping

This Agreement provides for a flood risk mapping program to determine and subsequently designate those urban areas within Manitoba that are prone to flooding. Appendix A lists "Areas and Floodways to be Mapped in the Province of Manitoba" as described in the original Mapping Agreement, including the additions and deletions incorporated in the

Amending Agreement (noted below). Provincial and federal Orders-in-Council were passed to add the main rivers in Winnipeg to the schedule of centres to be mapped. A public information program is conducted to inform people of the merits of the program, and to encourage acceptance and active participation.

I.4 Agreement Respecting Studies for Flood Damage Reduction

The Studies Agreement provides for studies in specific problem areas to determine the most suitable measures for reducing or mitigating the damaging effects of floods on existing developments.

I.5 Amending Agreement

In order to complete all the work scheduled in the Flood Risk Mapping Agreement and because of the need for additional funds, an amending agreement was negotiated between Canada and Manitoba during 1980-81. The General Agreement was extended to December 31, 1990. The Mapping Agreement was extended to December 31, 1984 with additional funds of $1,490,000. The termination date of the Studies Agreement was changed to December 31, 1985 with no additional funding. Beausejour was removed from the list of places to be mapped because no serious flood problem exists there. The Town of Gimli was added.

I.6 Amendments, 1985

Further amendments to the three flood damage reduction agreements were negotiated between Canada and Manitoba and concluded by an exchange of letters on September 6, 1985. The amendments were necessary in order to carry out the work scheduled in the Agreement Respecting Flood Risk Mapping and the Agreement Respecting Studies for Flood Damage Reduction. Specifically, the amendments were an extension to the

General Agreement Respecting Flood Damage Reduction from December 31, 1990 to March 31, 1994; an extension of the Agreement Respecting Flood Risk Mapping from December 31, 1984 to March 31, 1988 with additional funds of $160,000; and an extension to the Agreement Respecting Studies for Flood Damage Reduction from December 31, 1985 to March 31, 1989.

I.7 Agreement Respecting Flood Forecasting

The Flood Forecasting Agreement, a sub-agreement to the General Agreement, was signed by Canada and Manitoba on March 31, 1981. The objective of the Agreement is to improve the flood forecasting capability for the Red, Assiniboine and Souris rivers in Manitoba.

This Agreement is divided into two phases. The first phase included a pilot project on the Boyne River to develop a suitable improved streamflow forecasting model and to test and evaluate streamflow routing and field data acquisition systems. The second phase provides for the improvement of flood forecasting procedures for the Red, Assiniboine and Souris rivers.

Research to date has indicated that the conventional forecasting system has the potential, with some improvements, to provide forecasts of comparable accuracy with much less effort than the sophisticated model (HSPF) investigated under this Agreement. In order to complete these improvements and to meet the objectives of the Agreement, federal and provincial treasury board approvals were obtained to extend the Agreement duration from March 31, 1986 to September 30, 1989 with additional funding of $400,000.

I.8 Agreement Respecting the Construction of Flood Protection Projects in Manitoba

The Agreement Respecting the Upgrading of Ring-Dykes in the Red River Valley was signed on March 10, 1983 to upgrade the ring-dykes at eight

communities in the valley . This original agreement provided up to $4.5 million to raise existing ring-dykes at Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe to withstand a 100-year flood. The federal government has agreed to fund 45 per cent of the capital cost of each project while the Province is responsible for 55 per cent. Ring-dykes are the only practical measures to protect existing and future development in these communities. Flood waters spread out for many kilometres in the very flat valley and the alternative of diverting development to areas that are not flood prone is not feasible.

Amendments to the Agreement Respecting the Upgrading of Ring-Dykes in the Red River Valley were signed on May 22, 1985. The amendments consisted of an extension in time to March 31, 1989 and the provision of an additional $1.6 million in funding for upgrading the dyking system at the Village of Ste. Rose du Lac and the construction of a dyke protecting the water treatment plant at the Town of Souris. With the addition of Ste. Rose du Lac and Souris which are outside of the Red River Valley, the Agreement was renamed "An Agreement Respecting the Construction of Flood Protection Projects in Manitoba".

Negotiation of the Agreement Respecting the Construction of Flood Protection Projects in Manitoba was co-ordinated by the Steering Committee responsible for the Flood Damage Reduction Program. However, this Agreement is managed and reported on to the ministers directly by the Implementation Committee.

CHAPTER II

PROGRAM ORGANIZATION

II.1 Introduction

Under the terms of the General Agreement Respecting Flood Damage Reduction, a Steering Committee was established consisting of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. The Steering Committee provides direction for the program and reports to the Ministers annually.

A Technical Committee on Flood Risk Mapping was established under the terms of the Agreement Respecting Flood Risk Mapping. This committee also consists of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. It supervises and conducts the work program of the Agreement Respecting Mapping and the Agreement Respecting Studies for Flood Damage Reduction. The Technical Committee reports to the Steering Committee.

A Studies Sub-Committee was established in mid-1981 by the Steering Committee to oversee the work conducted under the Agreement Respecting Studies for Flood Damage Reduction. This Sub-Committee consists of three members. The federal Co-Chairman of the Steering Committee appointed one member, while the provincial Co-Chairman of the Steering Committee appointed two members.

A Technical Sub-Committee on Flood Forecasting was established by the Steering Committee to supervise and undertake tasks under the terms of the Agreement Respecting Flood Forecasting. The Sub-Committee consists of two members appointed by the federal Co-Chairman of the Steering Committee and two members appointed by the provincial Co-Chairman.

II.2 Membership: Steering Committee

Members of the Steering Committee in 1986-87 were:

Canada	Manitoba
Mr. R. A. Halliday (Co-Chairman) Director Inland Waters and Lands Western and Northern Region Environment Canada Regina, Saskatchewan	Mr. N. Mudry (Co-Chairman) Chief of Water Management Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. R. L. Pentland Director Water Planning and Management Branch Inland Waters and Lands Environment Canada Ottawa, Ontario	Mr. J. N. Whiting Director Municipal Planning Branch Department of Municipal Affairs Winnipeg, Manitoba

In accordance with guidelines established in the General Agreement, the committee chairmanship alternated to the federal side of the Steering Committee during the tenth year of the program. Mr. Halliday served as chairman at the three meetings held in Winnipeg during the report year. Mr. G. Felton of Environment Canada, Inland Waters and Lands, Western and Northern Region, acted as secretary for the meetings.

II.3 Membership: Technical Committee on Flood Risk Mapping

Members of the Technical Committee in 1986-87 were:

Canada	Manitoba
Mr. H. K. Naik (Co-Chairman) Senior Water Resources Planner Water Planning and Management Branch Western and Northern Region Environment Canada Regina, Saskatchewan	Mr. F. P. Barlishen (Co-Chairman) Head Flood Damage Reduction Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. D. G. Anderson Chief Data Acquisition and Program Planning Topographical Survey Directorate Energy, Mines and Resources Canada Ottawa, Ontario	Mr. F. W. Leeman Chief Mapping Section Surveys and Mapping Branch Department of Natural Resources Winnipeg, Manitoba

Based on the same guidelines as those for the Steering Committee, the provincial side resumed the chairmanship for fiscal year 1986-87. Mr. Naik chaired the first meeting held in Winnipeg. Mr. Barlishen chaired two other meetings that were also held in Winnipeg. Mr. R. Richardson of the Manitoba Department of Natural Resources served as secretary.

II.4 Membership: Studies Sub-Committee

Members of the Studies Sub-Committee in 1986-87:

Canada	Manitoba
Mr. H. K. Naik (Co-Chairman) Senior Water Resources Planner Water Planning and Management Branch Western and Northern Region Environment Canada Regina, Saskatchewan	Mr. F. P. Barlishen (Co-Chairman) Head Flood Damage Reduction Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
	Dr. H. Schellenberg Agricultural Resource Economist Department of Agriculture Winnipeg, Manitoba

Based on the same guidelines as those for the Steering Committee, the federal side resumed the chairmanship for the fiscal year 1986-87. There were no meetings held during the reporting period as no studies were completed during 1986-87.

II.5 Membership: Technical Sub-Committee on Flood Forecasting

Members of the Flood Forecasting Sub-Committee in 1986-87 were:

Canada	Manitoba
Mr. R. A. Hale (Co-Chairman) Regional Chief Water Resources Branch Environment Canada Winnipeg, Manitoba	Mr. V. M. Austford (Co-Chairman) Chief of Hydrotechnical Services Water Resources Branch Department of Natural Resources Winnipeg, Manitoba
Mr. R. Raddatz Scientific Services Meteorologist Scientific Services Division Atmospheric Environment Service Environment Canada Winnipeg, Manitoba	Mr. R. J. Bowering Head Hydrology Section Water Resources Branch Department of Natural Resources Winnipeg, Manitoba

Mr. Hale was chairman during the report year. Seven meetings were held in Winnipeg. Mr. J. Way of the Water Resources Branch, Environment Canada acted as secretary.

CHAPTER III

PROGRAM IMPLEMENTATION

III.1 Scope

Originally, flood risk maps and flood damage reduction studies were to be prepared for 45 communities in Manitoba as listed in Schedule A of the Agreement Respecting Flood Risk Mapping (this schedule with amendments and additions is shown as Appendix A of this report). A location map is attached as Appendix B. However, Canada and Manitoba signed an agreement on March 10, 1983 under which they have agreed to share the cost of upgrading existing dyking systems to the one percent protection level in eight of these communities. Therefore, mapping or studies are not necessary for the communities of Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild or St. Adolphe. Although the base maps have been completed for Ste. Rose du Lac, no flood risk mapping studies will be done as plans are under way to upgrade the flood protection works in the community under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba.

Flood risk areas are determined and plotted on detailed engineering maps and smaller scale public information maps. Policies which discourage further flood-prone development come into effect when the Minister of the Environment for Canada and the Minister of Natural Resources for Manitoba designate the flood risk areas.

In communities where flood damage reduction studies are deemed necessary, an analysis is undertaken to determine the most economical and suitable measures to protect existing development from future flood damages. Agreements are negotiated to fund the construction of flood protection works, if such works are shown to be technically feasible and economically viable.

Research into developing improved flood forecasting procedures for the Red, Assiniboine and Souris rivers in Manitoba was conducted under the Agreement Respecting Flood Forecasting. This involved calibration of the HSPF hydrologic model on key tributaries of these rivers. Research into developing new forecasting procedures was concluded in 1985-86. At present, work is being directed towards improving the conventional forecasting system, mainly through improved data input and further use of computer systems.

III.2 Schedule

During the first year of the Flood Damage Reduction Program, a community work program schedule was prepared for the 45 centres to be mapped, based on flood history, and recognizing the potential for future developments in undeveloped urban flood prone areas. Since then, the City of Winnipeg and the Additional Zone were added to Schedule A, the General Agreement Respecting Flood Damage Reduction was extended to 1994, the Agreement Respecting Flood Risk Mapping to 1988, the Agreement Respecting Studies for Flood Damage Reduction to 1989, Phase One of the Flood Forecasting Sub-Agreement to 1984 and Phase Two to 1986. A further extension to the Agreement Respecting Flood Forecasting was requested in the previous report year. The federal and provincial treasury boards have approved this request.

III.3 Methodology

III.3.1 Flood Risk Mapping

The work program at each community for the flood risk mapping and flood damage reduction (FDR) studies begins with the preparation of 1:2000 scale topographic base maps showing planimetric and height information. Base map production is carried out in four steps, namely, aerial photography, control survey, aerial triangulation and map compilation.

Following the map preparation, hydrologic studies are undertaken to determine the magnitude of the design flood and the watershed's response to flood-generating events. The results of these studies function as an input to the hydraulic studies which systematically define design flood water surface profiles throughout the communities. The resulting flood risk lines are delineated on the base maps which are then used for engineering and planning purposes.

The Steering and Technical committees consult with the local government officials, to ensure a local awareness of the intent and implications of the program. They also review the delineation of the flood lines with the local officials to seek their support in the implementaion of the policies of the program.

When the Steering Committee has concurred in the delineation of the flood risk area and floodway (where applicable), the preliminary flood lines, which are plotted on the 1:2000 scale maps, are presented to the local councils for their review. The Ministers are then asked for their approval of the designation. Public information maps and brochures are then prepared.

The public information program is conducted concurrently with the mapping process. Floodplain residents and the remainder of the community are made aware of the Flood Damage Reduction Program through meetings, brochures, maps and the media.

III.3.2 Flood Damage Reduction Studies

Flood damage reduction studies are undertaken for selected communities. The purpose is to determine the measure which has the most favourable benefit-cost ratio for minimizing the

flood damage potential of existing development and also to guide future floodplain development practices. The studies describe present land uses, assess potential flood damages and identify and evaluate alternatives for reducing the potential for flood damage. Among the range of measures considered are structural and non-structural alternatives such as dyking, flood proofing, flood forecasting systems, emergency action and zoning. Zoning and formulation of by-laws for flood prone lands at the local government level are encouraged by program officials.

In a community where a dyke exists, the flood damage reduction study would include a geotechnical study of the dyke to assess the dyke's stability and to determine the requirement, if any, for upgrading the dyke to a standard acceptable under the Flood Damage Reduction Program. A survey by questionnaire or some other means may be undertaken in some communities where a recent large flood occurred. This survey would be conducted to determine the exact extent of damage caused by that flood. The results can be used to estimate the damages that would be caused by other floods up to the design flood. Additionally, a field survey is conducted in most communities to determine the first floor elevations of all structures in the flood risk area. The study report is used as the basis for a recommendation to governments on construction of flood mitigation works or implementation of non-structural measures such as purchase of flood-prone properties.

III.3.3 Flood Forecasting

The Flood Forecasting Program was divided into two phases. Phase One, which was completed on February 3, 1984, consisted mainly of a review of streamflow simulation models and testing the most promising models on the Boyne River.

Results of the detailed testing were analyzed and forecast accuracies were compared to those of current methods. The applicability of the models to other watersheds in the Assiniboine, Red and Souris river basins was assessed to ensure that the selected model could be used throughout the study area. Other work in Phase One included establishment and testing of real-time hydrometeorological data acquisition systems and an evaluation of stream channel routing procedures. Phase Two originally provided for the further refining of the model for its application to the Red, Assiniboine and Souris watersheds. However, the study has indicated that the conventional forecasting methodology has the potential, with improvements, to provide forecasts of similar accuracy with significantly less effort.

III.4 Work Assignments

All work activities under the Flood Damage Reduction Program are conducted under the general direction of the Steering Committee. The Flood Risk Mapping Technical Committee, the Studies Sub-Committee and the Flood Forecasting Sub-Committee supervise the work in their respective programs, and report to the Steering Committee on progress of work and on major issues.

The 1:2000 base maps and smaller scale public information maps have been compiled by private contractors. The inspection responsibility of the mapping has been vested in the Director of the Topographical Survey Division, Surveys and Mapping Branch of the Federal Department of Energy, Mines and Resources with the exception of the inspection of the aerial photography and survey control which, de facto, has been the responsibility of the Surveys and Mapping Branch of the Manitoba Department of Natural Resources. The use of the Manitoba Surveys and Mapping Branch mapping specifications was approved by the Technical Committee in 1981. The Manitoba Surveys and Mapping Branch also has

responsibility for the administration of tender invitation and awarding all contract work in accordance with the provincial contracting policies and the Canada-Manitoba Flood Damage Reduction Program.

The Water Resources Branch of the Manitoba Department of Natural Resources (MWRB) conducts all of the hydrologic and the majority of the hydraulic studies. Some hydraulic studies have been done by consultants and by Environment Canada. The MWRB is responsible for the administration of hydraulic study contracts. Cross-section surveys of the river channels are undertaken by the Engineering and Construction Branch of the Manitoba Department of Natural Resources.

The MWRB and Environment Canada, Regina, jointly conduct the public information program. Public Information Services of the Manitoba Department of Natural Resources plays an important role in this program by preparing brochures for each community, liaising with local officials,arranging meetings with local councils and the public, publicizing meetings, and providing information to all government agencies and municipalities on the implications of the Flood Damage Reduction Program.

The MWRB plays the lead role in the forecasting studies under the Flood Forecasting Program. Inland Waters and Lands and the Atmospheric Environment Service of Environment Canada, Winnipeg play the lead role in testing the real-time hydrometeorological data acquisition system. The Water Planning and Management Branch of Environment Canada in Ottawa is evaluating the applicability of dynamic channel routing on the Red River in Manitoba.

The Manitoba Department of Natural Resources provides the initial funding for the program and submits statements to Environment Canada for cost-sharing. Under the supervision of the Technical Committee, the MWRB is responsible for the overall administration of all contracts under the Flood Damage Reduction Program.

III.5 Expenditures

The Flood Risk Mapping Agreement originally provided for a total expenditure of $700,000 over five years. The Amending Agreement provided an additional $1,490,000 to complete most of the required mapping. An additional $160,000 was provided in 1985-86 under a further extension. A total of $310,000 is available for flood damage reduction studies under the Agreement Respecting Studies for Flood Damage Reduction. A total of $600,000 has been allocated to implement the Flood Forecasting Sub-Agreement and an additional $400,000 was approved by the federal and provincial treasury boards during the report year.

Expenditures from December 20, 1976 to March 31, 1987 are summarized in Table I. These costs were shared equally by Canada and Manitoba.

CHAPTER IV

ACTIVITIES UNDER THE FLOOD DAMAGE REDUCTION AGREEMENTS 1986/87

IV.1 Flood Risk Mapping Program

The following designations have been made under the program in previous years:

IV.1.1 Designation

Melita	-	Interim	-	December 20, 1979
Wawanesa	-	Interim	-	December 20, 1979
Winnipeg	-	Interim	-	February 15, 1980
Souris	-	Final	-	October 1, 1980
Elie	-	Final	-	November 5, 1980
Brandon	-	Final	-	March 26, 1982
Starbuck	-	Final	-	November 26, 1982
Sanford	-	Final	-	November 26, 1982
La Salle	-	Final	-	November 26, 1982
Swan River	-	Final	-	May 11, 1982
Dauphin	-	Final	-	February 15, 1984
Carman	-	Final	-	June 13, 1984
Lorette	-	Final	-	September 13, 1984

The designation process was initiated for Arborg, Fisher Branch and Riverton in 1986-87.

IV.1.2 Arborg: Icelandic River

The Steering Committee recommended designation of the flood risk areas to the ministers. The provincial minister approved of the recommendation. Approval of the federal minister is expected in 1987-88.

IV.1.3 Fisher Branch: Fisher River

The Steering Committee recommended designation of the flood risk areas to the ministers. The provincial minister approved the recommendation. Approval of the federal minister is expected in 1987-88.

IV.1.4 Gimli: Gimli Airport Drain

No work was done during the period of this report.

IV.1.5 Gladstone: Whitemud River

No work was done during the period of this report.

IV.1.6 Grande Pointe: Seine River

No work was done at this community during the period of this report.

IV.1.7 Gretna: Pembina River

No work was done during the period of this report.

IV.1.8 La Riviere: Pembina River

No work was done during the period of this report.

IV.1.9 MacGregor: Beaver Creek

No work was done during the period of this report.

IV.1.10 Melita: Souris River

A one zone interim designation has been in effect since December 20, 1979. No work was done towards final designation during the period of this report.

IV.1.11 Minnedosa: Little Saskatchewan River

No work was done during the period of this report.

IV.1.12 Morden: Dead Horse Creek

The Council of the Town of Morden has not indicated its concurrence in the definition of the flood risk area in the community. Discussions are continuing between the Steering Committee and the Town Council to resolve the situation.

IV.1.13 Neepawa: Whitemud River

The flood risk areas were defined and presented to the Council. Approval is expected from the Town in 1987-88.

IV.1.14 Ochre River: Ochre River

No work was done during the period of this report.

IV.1.15 Riverton: Icelandic River

The Steering Committee recommended designation of the flood risk areas to the ministers. The provincial minister approved the recommendation. Approval of the federal minister is expected in 1987-88.

IV.1.16 Ste. Anne: Seine River

No work was done during the period of this report.

IV.1.17 Ste. Rose du Lac: Turtle River

No work was done during the period of this report. Proposed improvements to existing flood protection works are included under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba.

IV.1.18 Souris: Souris River

No work was done during the period of this report. Proposed upgrading of the dyke protecting the water treatment plant at Souris is included under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba.

IV.1.19 The Pas: Saskatchewan River

The base mapping was completed by the Manitoba Surveys and Mapping Branch. The mapping is being inspected by Energy, Mines and Resources, Canada.

IV.1.20 Virden: Bosshill, Gopher and Scallion Creeks

The base mapping was completed by the Manitoba Surveys and Mapping Branch. The mapping is being inspected by Energy, Mines and Resources, Canada.

IV.1.21 Wawanesa: Souris River

Interim designation took place on December 20, 1979. No work was done towards final designation during the period of this report.

IV.1.22 Westbourne: Whitemud River

No work was done during the period of this report.

IV.1.23 Winnipeg

The base mapping of the Charelswood and St. Norbert areas of Winnipeg was completed by the Manitoba Surveys and Mapping Branch. The mapping is being inspected by Energy, Mines and Resources, Canada.

IV.1.23.1 Omands Creek

Work continued on the flood risk mapping study.

IV.1.23.2 Red and Assiniboine Rivers and Tributaries

Approval was obtained to re-designate an area of Winnipeg that was designated previously as being within the "floodway zone", as part of the "floodway fringe zone". This was done to accomodate flood-proofed development in the area. The effective date of this re-designation is April 1, 1987.

Work continued on the base mapping of the unmapped areas along the Assiniboine, La Salle and Red rivers within the city limits. This work is being done by the Manitoba Surveys and Mapping Branch.

IV.1.24 Woodside: Whitemud River

No work was done during the period of this report.

IV.1.25 Remaining Communities

As was reported in past annual reports, no work is planned for Hartney, Horndean, Rosenfeld or Thompson because of the low flood potential. Also, flood risk mapping will not proceed at Brunkild, Dominion City, Emerson, Letellier, Morris, Rosenort, St. Adolphe, St. Jean Baptiste or Ste. Rose du Lac as the Agreement Respecting the Construction of Flood Protection Projects in Manitoba will upgrade the level of protection offered by the existing dykes at these communities to conform to the one percent flood level. This level has been adopted as a minimum standard for the Manitoba FDR program.

IV.1.26 Field Survey Checks of Topographic Mapping

The final report on the program of field survey checks was completed during the period of this report. The objective of the program was to verify the accuracy of the mapping in selected communities. This information is useful when determining whether the accuracy of the maps will allow final or only interim designation to take place. The cost of the checking program was borne by Energy, Mines and Resources Canada.

IV.2 Flood Damage Reduction Studies Program

In previous years, flood damage reduction options were examined in studies completed for Ste. Rose du Lac (1977 and 1982), Souris 1981), and Brandon (1983). Other options were examined for Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe by the Ad Hoc Task Force on Manitoba Flood Mitigation Projects in 1981. Flood depth - damage curves were also developed from the flood damage data of the 1979 Red River flood in 1983. Table 2 shows the status of flood risk mapping and studies activities for each community on Schedule A.

During the period of this report, the Manitoba Water Resources Branch continued work on flood damage reduction studies at Elie, Morden and Riverton.

IV.3 The Flood Forecasting Agreement

Preparation of a formal report on Phase Two activities for the period February, 1984 to March, 1986 is nearing completion. Although a chapter on streamflow routing on the Boyne River has yet to be written, a detailed appendix on streamflow routing methodologies has been prepared.

The organization and filing of data files and computer programs from five years of streamflow simulation studies, except for the portion related to the above noted chapter, has been completed. This has allowed for the cost-effective storage of data and will facilitate future retrieval.

The dynamic streamflow routing study performed by Water Planning and Management, Environment Canada, has been completed for the Red River from Emerson to Ste. Agathe. The One-Dimensional dynamic routing configuration was transferred to the Manitoba Water Resources Branch computer in March, 1987. An attempt to run the model with forecasted tributary flows for the 1987 spring runoff was not completed due to difficulties with data entry and other technical matters.

The Atmospheric Environment Service has extended the evaluation period for the Telidon weather radar system. However, since there was no significant precipitation during the 1987 spring runoff, the Forecast Centre was unable to evaluate its usefulness for spring runoff forecasting.

Two hydrometric data transmission devices were purchased and will be installed in 1987. The Forecast Centre also acquired a computer terminal that was used effectively for data acquisition during the spring runoff. An information brochure on flood forecasting was completed and will be available for distribution in early 1987.

TABLE I

CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM

EXPENDITURES FOR 1977-87

	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1977-83(Total)
GENERAL AGREEMENT	$ 1,000.00	$ 1,254.91	$ -	$ 478.10	$ 664.88	$ 42.00	$ 3,439.89
General Mapping	-	15,260.68	18,315.52	47,527.83	37,841.59	79,246.38	198,192.00
Arborg	-	-	-	10,667.29	11,212.08	6,583.48	28,462.85
Assiniboine River	-	-	-	1,032.00	-	-	1,032.00
Brandon	-	-	81,502.96	75,457.90	32,798.75	4,131.64	193,891.25
Carman	17,082.12	21,957.83	6,577.98	23,815.41	15,361.80	389.38	85,184.52
Dauphin	-	-	19.70	39,746.68	34,095.53	11,161.48	85,023.39
Elie	22,817.76	27,270.36	6,798.22	9,040.40	487.05	174.91	66,588.70
Fisher Branch	-	-	-	8,802.96	12,838.20	12,806.15	34,447.31
Gimli	-	-	-	22.55	31,333.93	1,373.00	32,729.48
Gladstone	-	-	-	12,208.25	21,558.28	2,442.35	36,208.88
Grande Pointe	-	-	21.55	14,760.86	11,969.46	-	26,751.87
Gretna	-	-	-	414.00	17,943.40	365.00	18,722.40
Hartney	-	-	-	323.00	91.00	-	414.00
Horndean	-	-	-	403.00	91.00	-	494.00
La Riviere	-	-	-	251.00	31,189.27	4,339.96	35,780.23
La Salle	-	8,162.39	5,673.36	14,573.01	7,862.49	4,563.43	40,834.68
Lorette	-	-	-	624.55	21,910.29	18,293.59	40,828.43
MacGregor	-	-	-	6,092.13	28,415.53	1,850.47	36,358.13
Melita	8,806.00	9,536.44	2,102.46	10,172.60	56.42	430.78	31,104.70
Minnedosa	-	-	-	12,478.02	20,989.65	3,354.27	36,821.94
Morden	-	-	2,631.07	20,373.18	23,670.63	25,407.61	72,082.49
Neepawa	-	-	16,088.39	28,785.60	33,242.27	5,118.02	83,234.28
Ochre River	-	-	-	19,271.85	5,756.92	-	25,028.77
Ritchot	4,772.39	13,700.31	-	312.00	-	-	18,784.70
Riverton	-	-	-	6,052.92	15,129.77	4,483.00	25,665.69
Rosenfeld	-	-	-	427.00	14,350.09	253.00	15,030.09
Ste. Anne	-	-	-	482.00	32,963.33	13,064.86	46,510.19
Ste. Rose du Lac	-	-	14,219.19	16,657.66	12,273.59	4,860.16	48,010.60
Sanford	-	-	12,939.42	11,577.82	5,990.65	5,190.43	35,698.32
Souris	14,615.24	13,515.46	3,484.92	11,088.76	44.82	711.69	43,440.89
Starbuck	-	-	7,382.93	13,239.36	27,204.80	16,029.98	63,857.07
Swan River	-	-	-	17,206.72	17,851.50	9,370.26	44,428.48
The Pas	-	-	-	581.00	33,909.89	24,141.17	58,632.06
Thompson	-	-	-	433.00	14.00	-	447.00
Virden	-	-	-	146.00	38,866.04	13,250.51	52,262.55
Wawanesa	4,491.00	4,063.76	7,034.36	12,374.19	17.78	430.78	28,411.87
Westbourne	-	-	-	8,239.27	6,148.00	5,167.20	19,554.47
Winnipeg	-	37,563.98	47,660.87	9,585.35	3,461.52	4,724.14	102,995.86
Woodside	-	-	-	1,336.41	1,554.51	5,776.46	8,667.38
Brochure	3,500.00	-	-	-	-	-	3,500.00
TOTAL MAPPING	$76,084.51	$151,031.21	$232,432.90	$466,583.53	$610,495.83	$289,485.54	$1,826,113.52
General Studies	$ -	$ -	$ 2,177.48	$ 6.79	$ 7,357.23	$ 1,923.15	$ 11,464.65
Brandon	-	-	-	-	15,117.52	6,298.16	21,415.68
Carman	-	-	476.85	-	-	-	476.85
Gimli	-	-	-	-	2,817.49	60.00	2,877.49
Gladstone	-	-	-	-	-	299.61	299.61
Letellier	-	-	-	-	575.93	-	575.93
Morden	-	-	-	-	-	3,146.21	3,146.21
Morris	-	-	-	-	195.25	-	195.25
Ste. Rose du Lac	-	-	-	3,982.87	8,826.92	1,215.20	14,024.89
Souris	-	-	-	-	4,389.62	1,215.20	5,604.82
Wawanesa	-	-	1,320.00	-	-	-	1,320.00
Winnipeg	-	-	4,368.65	261.08	361.98	-	4,991.71
TOTAL STUDIES	$ -	$ -	$ 8,342.98	$ 4,250.74	$ 39,641.84	$ 14,157.53	$ 66,393.09
Flood Forecasting							
- Phase I	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23	$ 243,760.14
- Phase II	-	-	-	-	-	-	-
TOTAL FLOOD FORECASTING	$ -	$ -	$ -	$ -	$ 71,087.91	$172,672.23	$ 243,760.14
GRAND TOTAL	$77,084.51	$152,286.12	$240,775.88	$471,312.37	$721,890.46	$476,357.30	$2,136,266.75

TABLE I (Continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
EXPENDITURES FOR 1977-87

	1983-84	1984-85	1985-86	1986-87	1977-87(Total)
GENERAL AGREEMENT	$ -	$ -	$ -	$ -	$ 3,439.89
General Mapping	56,429.23	39,223.22	9,299.64	8,257.55	311,401.64
Arborg	12,548.35	758.14	3,616.35	1,243.89	46,629.58
Assiniboine River	-	-	-	-	1,032.00
Brandon	1,454.00	-	-	-	195,345.25
Carman	810.00	6,316.15	45.00	-	92,355.67
Dauphin	8,732.03	6,099.25	58.50	47.39	99,960.56
Elie	1,357.25	-	-	-	67,945.95
Fisher Branch	19,683.03	7,812.66	6,347.29	9,955.30	78,445.59
Gimli	-	-	-	-	32,729.48
Gladstone	5,073.58	10,731.74	-	-	52,014.20
Grande Pointe	2,006.97	-	-	-	28,758.84
Gretna	-	-	-	-	18,722.40
Hartney	-	-	-	-	414.00
Horndean	-	-	-	-	494.00
La Riviere	-	-	-	-	35,780.23
La Salle	72.48	-	-	589.16	41,496.32
Lorette	6,809.60	4,235.61	777.50	47.39	52,698.53
MacGregor	29.97	-	-	-	36,388.10
Melita	-	-	-	-	31,104.70
Minnedosa	544.21	12,343.65	-	-	49,709.80
Morden	27,302.71	4,115.90	4,581.00	8,842.55	116,924.65
Neepawa	561.33	28,840.80	3,454.34	4,271.45	120,362.20
Ochre River	199.30	-	-	-	25,228.07
Ritchot	-	-	-	-	18,784.70
Riverton	16,382.52	9,119.84	1,814.31	4,478.67	57,461.03
Rosenfeld	-	-	-	-	15,030.09
Ste. Anne	319.42	-	-	-	46,829.61
Ste. Rose du Lac	-	-	-	-	48,010.60
Sanford	72.46	-	-	-	35,770.78
Souris	-	-	-	-	43,440.89
Starbuck	1,651.61	-	-	-	65,508.68
Swan River	6,182.67	-	-	-	50,611.15
The Pas	18,866.90	-	373.38	3,235.90	81,108.24
Thompson	-	-	-	-	447.00
Virden	7,547.42	-	373.39	1,918.90	62,102.26
Wawanesa	-	-	-	-	28,411.87
Westbourne	3,505.82	-	-	-	23,060.29
Winnipeg	9,624.95	-	5,830.96	40,981.18	159,432.95
Woodside	-	-	-	-	8,667.38
Brochure	-	-	-	-	3,500.00
TOTAL MAPPING	$207,767.81	$129,596.96	$ 36,771.66	$ 83,869.33	$2,284,119.28
General Studies	$ -	$ 8,691.18	$ 39,294.33	$ 8,433.13	$ 67,883.29
Brandon	-	-	-	-	21,415.68
Carman	-	-	-	-	476.85
Elie	-	3,697.17	13,562.22	971.19	18,190.58
Gimli	-	-	-	-	2,877.49
Gladstone	-	-	-	-	299.61
Letellier	-	-	-	-	575.93
Morden	411.55	7,371.52	21,034.43	21,765.00	53,728.71
Morris	-	-	-	-	195.25
Riverton	-	6,848.73	22,474.67	23,544.60	52,868.00
Ste. Rose du Lac	-	-	-	-	14,024.89
Souris	-	-	-	-	5,604.82
Wawanesa	-	-	-	-	1,320.00
Winnipeg	-	-	69.87	69.87	5,131.45
TOTAL STUDIES	$ 411.55	$ 26,568.60	$ 96,435.52	$ 54,783.79	$ 244,592.55
Flood Forecasting					
- Phase I	$109,858.63	$ -	$ -	$ -	$ 353,618.77
- Phase II	15,887.29	118,349.63	102,294.36	114,505.49*	351,036.77
TOTAL FLOOD FORECASTING	$125,745.92	$118,349.63	$102,294.36	$114,505.49*	$ 704,655.54
GRAND TOTAL	$333,925.28	$274,515.19	$235,501.54	$253,158.61	$3,236,807.26

* An expenditure of $114,505.49 was funded by Manitoba for flood forecasting activities during the period of this report. Manitoba will be reimbursed by Canada for one half of this amount in 1987-88.

TABLE 2
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Arborg	completed			
Assiniboine River	no			Because of the high cost of mapping, this project will not be done.
Brandon	completed	82 03 26	completed	
Brunkild	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Carman	completed	84 06 13	completed	
Dauphin	completed	84 02 15		
Dominion City	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Elie	completed	80 11 05	under way	
Emerson	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Fisher Branch	completed			
Gimli	completed			No further activities will be done under this Agreement as the Province will be constructing a diversion to control flooding.
Gladstone	completed			
Grande Pointe	completed			
Gretna	completed			It is unlikely that flood risk maps will be prepared as the community is affected from overflows of the Pembina River located on the U. S. side.

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Hartney	no	No work is planned because of low flood potential.		
Horndean	no	No work is planned because of low flood potential from overflows of the Hespeler Channel		
La Riviere	completed			
La Salle	completed	82 11 26		
Letellier	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Lorette	completed	84 09 13		
MacGregor	completed			
Melita	completed	79 12 20 (I)		Interim designation based on existing topographical maps.
Minnedosa	completed			
Morden	completed		under way	
Morris	no	No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba		
Neepawa	completed			
Ochre River	completed			
Ritchot	no	Will not be done because of the high cost of mapping.		
Riverton	completed		under way	
Rosenfeld	completed			

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Rosenort	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
St. Adolphe	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Ste. Anne	completed			
St. Jean Baptiste	no			No work will be done under this Agreement as the existing ring dyke is being upgraded under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Ste. Rose du Lac	completed		completed	No further work will be done under this Agreement as flood protection works will be constructed under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Sanford	completed	82 11 26		
Souris	completed	80 10 01	done (SRBS)	Flood protection works for the Water Treatment Planthouse will be constructed under the Agreement Respecting the Construction of Flood Protection Projects in Manitoba
Starbuck	completed	82 11 26		
Swan River	completed	82 05 11		
The Pas	under way			

TABLE 2 (continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
STATUS REPORT TO MARCH 31, 1987

Communities	Base Map	Designation Date	Flood Damage Reduction Study	Remarks
Thompson	no	No work will be done as flood prone lands are under license for water power generation.		
Virden	under way			
Wawanesa	completed	79 12 20 (I)	done (SRBS)	Interim designation based on existing topographical maps
Westbourne	completed	Base maps do not meet specifications.		
Winnipeg Red, Assiniboine and Seine Rivers	no	80 02 15 (I)		Interim designation based on existing topographical maps.
La Salle River	under way			
Omands Creek	no			
Woodside	completed			

Notes:
- "done" means action was completed.
- "no" means action will not be done.
- "(I)" means interim designation.
- "SRBS" means study carried out under the Souris River Basin Study.

APPENDIX "A"

AREAS AND FLOODWAYS TO BE MAPPED IN THE PROVINCE OF MANITOBA

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Brandon and R.M. of Cornwallis	Assiniboine River from west of 21-10-19 W.P.M. to east of 19-10-18 W.P.M.	No
R.M. of Portage la Prairie, R.M. of St. Francois Xavier, R.M. of Cartier and the City of Winnipeg	Assiniboine River from Portage la Prairie to the western limit of the City of Winnipeg	No
Carman and R.M. of Dufferin	Boyne River from west of 23-6-5 W.P.M. to east of 29-6-4 W.P.M.	Yes
Gimli and R.M. of Gimli	Overflows from the Gimli Airport Drain. Area to be mapped to be shown on location plan.	Yes
Thompson and L.G.D. of Mystery Lake	Burntwood River (to be shown on location plan)	No
Fisher Branch and L.G.D. of Fisher	Fisher River from west of 14-24-2 W.P.M. to east of 24-24-2 W.P.M.	Yes
Arborg and R.M. of Bifrost	Icelandic River from west of 22-22-2 E.P.M. to east of 24-22-2 E.P.M.	Yes
Riverton and R.M. of Bifrost	Icelandic River from south of 17-23-4 E.P.M. to north of 21-23-4 E.P.M.	Yes
Rosenort and R.M. of Morris	Morris River from south of 6-6-1 E.P.M. to north of 7-6-1 E.P.M.	No
Brunkild and R.M. of MacDonald	Morris River from south of 19-7-1 W.P.M. to north of 30-7-1 W.P.M.	No
Minnedosa and R.M. of Minto	Minnedosa River from west of 3-15-18 W.P.M. to north of 1-15-18 W.P.M.	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Ochre River and R.M. of Ochre River	Ochre River from south of 9-24-17 W.P.M. to north of 15-24-17 W.P.M.	Yes
Gretna and R.M. of Rhineland	Pembina River (in 5-1-1 W.P.M.)	Yes
La Riviere and R.M. of Pembina	Pembina River from west of 25-3-10 W.P.M. to south of 19-3-9 W.P.M.	No
Emerson and R.M. of Montcalm and R.M. of Franklin	Red River from International Boundary to north of 12-1-2 E.P.M.	No
Letellier and R.M. of Montcalm	Red and Aux Marais Rivers from south of 18-2-2 E.P.M. to east of 20-2-2 E.P.M.	No
Morris and R.M. of Morris	Red and Morris Rivers from east of 35-4-1 E.P.M. to east of 2-5-1 E.P.M.	No
St. Jean Baptiste and R.M. of Montcalm	Red and Plum Rivers from south of 36-3-1 E.P.M. to north of 1-4-1 E.P.M.	No
R.M. of Ritchot and the City of Winnipeg	Red River from southern limit of R.M. of Ritchot to Red River Floodway Control Structure	Yes
Elie and R.M. of Cartier	La Salle River from north of 11-11-3 W.P.M. to south of 2-11-3 W.P.M.	Yes
Starbuck and R.M. of MacDonald	La Salle River from west of 26-9-2 W.P.M. to east of 25-9-2 W.P.M.	Yes
Sanford and R.M. of MacDonald	La Salle River from north of 30-8-1 E.P.M. to south of 29-8-1 E.P.M.	Yes
R.M. of Ritchot, R.M. of MacDonald and the City of Winnipeg	La Salle River from east of 32-8-2 E.P.M. to Red River	Yes
Dominion City and R.M. of Franklin	Roseau River from north of 19-2-3 E.P.M. to east of 20-2-3 E.P.M.	No
The Pas and L.G.D. of Consol	Saskatchewan River Pasquia River to Rahl's Island	Yes
Grande Pointe and R.M. of Ritchot	Seine River from Grande Pointe (west of 20-9-4 E.P.M.) to Red River Floodway	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Lorette and R.M. of Tache	Seine River from west of 8-9-5 E.P.M. to the quarter section line of 9-9-5 E.P.M.	Yes
Ste. Anne	Seine River within the village of Ste. Anne	Yes
Winnipeg	Sturgeon Creek from P.T.H. No. 101 to Assiniboine River	No
Melita and R.M. of Arthur	Souris River from west of 31-3-26 W.P.M. to east of 6-4-26 W.P.M.	No
Hartney and R.M. of Cameron	Souris River from Hartney Dam to west of 17-6-23 W.P.M.	No
Souris and R.M. of Glenwood	Souris River from south of 33-7-21 W.P.M. to one half mile east of P.R. 250	No
Wawanesa and the R.M. of Oakland	Souris River from west of 23-7-17 W.P.M. to east of 26-7-17 W.P.M.	No
Swan River and R.M. of Swan River	Swan River from south of 26-36-27 E.P.M. to east of 28-36-27 W.P.M.	Yes
Ste. Rose du Lac and R.M. of Ste. Rose	Turtle River from Ste. Rose Dam to north of 8-24-15 W.P.M.	Yes
Dauphin and R.M. of Dauphin	Vermillion River from quarter section line of 4-25-19 W.P.M. to north of 15-25-19 W.P.M.	Yes
Gladstone and R.M. of Westbourne	Whitemud River from west of 30-14-11 W.P.M. to east of 32-14-11 W.P.M.	Yes
Westbourne and R.M. of Westbourne	Whitemud River from P.T.H. No. 4 to north of 25-13-9 W.P.M.	Yes
Woodside and R.M. of Westbourne	Whitemud River from west of 16-14-10 W.P.M. to east of 9-14-10 W.P.M.	Yes
Neepawa and R.M. of Langford	Whitemud River from southern Town Limit to north of 34-14-15 W.P.M.	No
Morden and R.M. of Stanley	Dead Horse Creek from Morden Dam to north of 8-3-5 W.P.M.	Yes
Virden and R.M. of Wallace	Gopher Creek from north of 27-10-26 W.P.M. to south of 15-10-26 W.P.M.	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Horndean and R.M. of Rhineland	Hespeler Channel from quarter section Line of 9-3-2 W.P.M. to quarter section line of 10-3-2 W.P.M.	Yes
Rosenfeld and R.M. of Rhineland	Overflows from Hespeler Channel. Area to be mapped to be shown on location plan	Yes
MacGregor and R.M. of North Norfolk	Beaver Creek. Area to be mapped to be shown on location plan	Yes
Winnipeg and Additional Zone	Red and Assiniboine Rivers and Tributaries	Yes

APPENDIX B

Location of Areas
In the Canada – Manitoba Flood Risk Mapping Agreement

LEGEND:

- ● Designated areas
- ○ Areas to be designated